Oral | Symbol S (Solid Earth Sciences) | S-SS Seismology

[S-SS33_30AM2]Crustal Deformation

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Wed. Apr 30, 2014 11:00 AM - 12:45 PM 315 (3F)

Study of crustal deformation plays an extremely important role in the investigation of wide scale earth dynamics those are earthquake and volcanic activity, plate motion and so on. In our session, we discuss the study related to crustal deformation, such as development of observation instrument, observed crustal deformation, analysis method, and simulation study.

12:30 PM - 12:45 PM

[SSS33-P02_PG]Coseismic slip distribution for the 2011 Tohoku-Oki earthquake with topographic corrections

3-min talk in an oral session

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Keywords:crustal deformation, the 2011 Tohoku-Oki earthquake, topography, sphere

Seismological study (Ide et al., 2011) revealed that the rupture of the 2011 Tohoku-Oki earthquake extended to the Japan Trench (i.e. free surface). Since the depth of the trench is about 8km, it is not appropriate to use green functions for elastic half-space media as given by e.g., Okada (1992). When we employ green functions for the half-space, it is not possible to satisfy the following two conditions simultaneously; (1) the updip limit of the rupture is ~8km deeper than the ground surface, and (2) the rupture extends to the free surface (i.e. the trench). If the condition (1) is satisfied, the rupture extends to ~8km at depth, not to the free surface. On the other hand, if the condition (2) is satisfied, the depth of the trench must match to the ground surface. The maximum discrepancy in between predicted ground displacements for the condition (1) and (2) is 5% in horizontal, and 15% in vertical component. Thus, it may be important to take the topography into account in green functions. In this study we applied the topographic correction on green functions as proposed by Williams and Wadge (2000). Segall (2010) suggests that this method is applicable to approximately incorporate the earth sphericity into green function for observation sites within about 600km from the dislocation. Combining those two corrections, we are able to calculate corrected green functions for spherical earth with topography. Although this method gives only approximate green functions, it helps us to investigate the dependence of green functions on topography and fault geometry.Then we use the corrected green functions for the inversion of coseismic slip distribution for the 2011 Tohoku-Oki earthquake. In the invsersion we use the following data set: GEONET F3 solutions obtained by the Geospatial Information Authority of Japan (GSI), the ocean bottom deformation data by the Japan Cast Guard (Sato et al., 2011), and that of Tohoku University (Kido et al., 2011; Ito et al., 2011). Then the inversion result is compared with the half-space solutions.

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